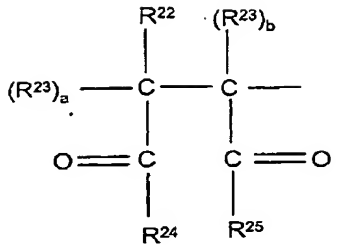
Attorney's Docket: 2000DE441D
Serial No.: 10/606,095
Art Unit 1714
Response to Office Action, Dated 11/14/2006

REMARKS

The Office Action mailed November 14, 2006 has been carefully considered together with each of the references cited therein. The amendments and remarks presented herein are believed to be fully responsive to the Office Action. Accordingly, reconsideration of the present Application in view of the following remarks is respectfully requested.

Applicant has amended the Specification to delete Table 2 and related footnotes on page 37 and the reference to Table 2 in paragraph [00100]. Applicant recently discovered arithmetic errors in Table 2 in the calculation of the compositions. Applicant has amended Table 8, row 2 to properly reflect the additive composition. Support for the amendment to Table 8 may be found in Applicant's Specification in Table 2 and the associated footnote which states that 37 is A1 plus 2000 ppm of B8. It is believed that no new matter has been added by this amendment. Applicant has amended the claims to more clearly recite what Applicant believes to be the invention. In claim 11, Applicant has replaced the term "at room temperature or below" with the term "at a temperature of 0°C or below" to further clarify that the blending of Applicant's novel additive is stable and remains a working fluid at low temperatures. Support for the amendment to claim 11 may be found in Applicant's specification in paragraphs [009] and [0012]. It is believed that no new matter is introduced by these amendments. Claims 7, 11-17 are pending in the application.

The instant application is directed to a storage stable additive concentrate comprising fatty acids and a specified polar nitrogen compound, wherein the polar nitrogen compound comprises 20 to 80 mol-% of a divalent structural unit as recited in claim 1 according to formula 12 :



(12)

The additive concentrate is useful for improving the lubricity of low-sulfur middle distillate fuel oils. More particularly, Applicant's invention relates to a method for combining a storage stable and homogeneous additive mixture with a low sulfur middle distillate at a low blending temperature; i.e., at or below a temperature of 0°C, without the need to store or dispense the additive in greatly diluted form and without the need to combine the additive concentrate with middle distillate in heated storage tanks and lines to provide the desired improvement and to dissolve the additive in the middle distillate.

Claims 7, 10-13 and 15 were rejected under 35 U.S.C. §103(a) as being unpatentable over JP 11001692 in view of Krull (US 5,391,632). The rejection of claim 7 as amended under 35 U.S.C. §103(a) as being unpatentable over JP 11001692 should be withdrawn for the reason that JP 11001692 does not disclose an additive containing a mixture of fatty acids and the polar nitrogen-containing terpolymer compound claimed by the applicant and no one skilled in the art would be motivated to employ Applicant's specific terpolymer based on the combination of the JP 11001692 disclosure and the general teachings of the US 5,391,632 reference to arrive at Applicant's storage stable composition.

Applicant notes that in making the first rejection of claim 7 under 35 U.S.C. §103(a), the examiner provided a machine translation of the JP reference. In making the current rejection under 35 U.S.C. §103(a), the examiner has now supplied an English translation by McElroy. In both translations, the JP reference discloses in

paragraph [0020] that cold flow improvers, inter alia a polymer having imide/amide compounds formed from unsaturated polybasic carboxylic acids and primary amines as monomers[McElroy page 7, lines 5-6 and Machine Translation page 3 lines 46-48], can be added to middle distillates containing fatty acids as lubricity improvers without negative interactions of the fatty acids to the performance of the cold flow improver(s). In paragraph [0018] of both translations, the JP reference states that it is appropriate for the addition of the fatty acid mixture for the fuel oil constituent of this invention to consider as 0.004-0.2% of the weight or preferably 0.002 to 0.1% of the weight 0.001 to 0.5% of the weight of the above mentioned specific middle distillate. They further state that when the addition exceeds 0.5% of the total weight, the addition effectiveness reaches a saturation state, and the lubritive gain effectiveness of balancing an addition is not acquired. Moreover, when an addition is less than 0.001% of the weight, sufficient lubricative grant effectiveness is not acquired. In paragraph [0019], in the machine translation in sentence 2 and 3, it states that although a cold-temperature fluidity improver is usually added..., the fuel oil constituent of this invention can raise lubricity [of the fuel oil mixture], without blocking the effectiveness of a cold-temperature fluidity improver. The machine translation then states:

> "Although the fatty-acid mixture and the cold-temperature fluidity improver of this invention can be included at a rate of arbitration, the weight ratio of fatty-acid mixture and a cold-temperature improver has a desirable rate of 1:10-5:1."

In the corresponding paragraph [0019] in the new McElroy translation, it states:

> "In this invention, even when fatty acid mixtures are added, the lubricity of middle distillates which comply with the environmental regulations can be obtained. For use in cold seasons or cold districts, usually low-temperature flow improving agents are added, however, the fuel oil compositions of this invention can improve lubricity without obstructing the effect of low-temperature flow improving agents. The fatty acid mixtures of this invention

can be mixed with low-temperature flow improving agents at any mixing ratio, however, the mixing ratio of the former to the latter is preferably 1:10 to 5:1." It is Applicant's opinion that paragraph [0019] in either English translation, must be read and understood in the context of the entire document. With reference to paragraph [0018], the teaching clearly refers only to mixture of middle distillates with fatty-acid lubricity additives, and in addition, a cold-flow improver. Then, reading the topic sentence (sentence 2) of paragraph [0019] of the McElroy translation, which consists of only 3 sentences, it states that "the fuel oil compositions of this invention can [exhibit] improve[d] lubricity without obstructing the effect of low-temperature flow improving agents." The third sentence then qualifies this statement by providing a mixing ratio for the fatty acid to the cold flow improver **within that fuel oil composition**. There is no disclosure in the JP reference of a storage stable, flowable additive mixture without middle distillates. The JP reference is silent on the use of any of Applicant's specific terpolymers which are nitrogen-containing compounds for the improvement of the cold flow properties of fatty acids. The JP reference does not teach any iodine number of the mixture of the fatty acids. The JP reference does not teach or suggest that the nitrogen-containing polymers must be present in the additive in an amount of from 0.01 to 90% by weight, based on the total weight of the fatty acids and the nitrogen containing compound A1), A2) and B). The Examiner alleges that it would be obvious to anyone skilled in the art based on the disclosure of Krull ('632 at column 2, lines 21-32, shown hereinbelow) to combine the nitrogen-containing compounds of the '632 Patent which discloses the terpolymer paraffin dispersant with "other cold temperature fluidity improvers."

> It has likewise been found that addition of alcohol/amine-modified terpolymers based on α,β-unsaturated dicarboxylic anhydrides, α,β-unsaturated compounds and polyoxyalkylene ethers of lower unsaturated alcohols, if desired in admixture with known paraffin inhibitors, preferably copolymers based on ethylene and vinyl acetate, results in the paraffin crystals which precipitate on cooling remaining dispersed. As a result of this uniform dispersion, a homogeneously turbid phase is obtained in which the CFPP (cold filter plugging point) value, which is critical for operability, of the upper and lower phases is approximately the same.

Based on Applicant's reading of the above paragraph, the '632 Patent discloses the combination of the terpolymer polar nitrogen containing paraffin inhibitor with other "**known paraffin inhibitors**" and specifically mentions copolymers based on ethylene and vinyl acetate. Nowhere in the '632 Patent or in the JP reference are fatty acids disclosed as paraffin inhibitors. In fact, fatty acids do not function as paraffin inhibitors, but tend themselves to crystallize at low temperatures giving rise to handling problems. (See Applicant's Specification at paragraph [009]. No one skilled in the art based solely on this disclosure in the '632 would be motivated to combine fatty acids, and in particular the mixture of fatty acids which are disclosed in the JP reference (See paragraphs [0018] and [0019]) as **lubricity** improvers, **not paraffin inhibitors**, with the paraffin inhibiting terpolymers disclosed in the '632 Patent for the purpose of creating a low-temperature storage stable, flowable additive mixture. Obvious to try is not the standard of 35 USC 103. The prior art references must be read as a whole and consideration must be given where the reference diverge and teach away from the claimed invention. No one skilled in the art would be able to combine any of the teachings of the JP and '632 references to render the instant invention obvious without the improper use of hindsight.

Furthermore, Applicant has demonstrated in Applicant's Specification in Tables 1 the unexpected improvement in the cold flow properties of the additive for the claimed combination. In Tables 3 and 4, Applicant demonstrated the unexpected improvement in storage stability for the claimed mixtures compared to the storage stability of the individual components. For example in Table 1, compare Example C2, a mixture of oleic and linoleic fatty acids (A2), and C3, a polar nitrogen compound being a product of a terpolymer of C_{14}/C_{16}-alpha-olefin, maleic anhydride and allylpolyglycol with 2 equivalents of ditallow fatty amine (B1) in a 50% by weight naphtha solution, with Examples 13-15, according to the subject application. Note that the pour points of C2 and C3 were 6 and 9, respectively, with the pour points of Examples 13-15, representing compositions of 80/20 to 20/80 wt-% of the fatty acid mixture to the polar nitrogen compound having pour points of -27 to -54 °C. In Table

3, Examples 39 and 40 showed that additive concentrate mixtures of 20/80 and 80/20 remained liquid after 3 days at -20 °C, while individual components A2 and B1 shown as Examples C9 and C10 showed that at -20°C, the individual A2 and B1 components were both solid. In Table 4, Examples 43-48, compared to Example C13 showed that without any of component B1 in fatty acid mixture A1, having an Iodine Number of 155 g of I/100g, that A1 always produced a sediment, while Examples 43-48 representing increasing proportions of B1 ranging from 100 to 50,000 ppm in the additive concentrate showed no sediment over 7 days at -20°C, and no sediment after 1 day at -28°C.

Still further, attached to this response is a Declaration submitted by Dr. Matthias Krull, one of the named inventors of the subject application, under 37 C.F.R. 1.132 which presents additional data comparing the present invention to combinations of fatty acids such as disclosed in the JP Reference and compositions of fatty acids and the polar nitrogen-containing compounds disclosed as B1 in Applicant's Specification. A variety of cold flow improvers selected from the list of materials which were disclosed in the Japanese reference (JP 11-001692) were tested in comparison to the polar nitrogen-containing compound B1) of the subject application to assess the cold flow improvement of fatty acid mixtures and their solutions in organic solvents. The materials used were the following:
Fatty Acids:

A3) Tall oil fatty acid comprising 29 % oleic acid, 64 % linoleic and other polyunsaturated acids and 3 % of saturated acids. Iodine number 158 gI/100g. (similar to A1 of the subject application)

A4) Oleic acid (technical grade) comprising 67 % oleic acid, 11 % linoleic acid, 5 % of hexadecenoic acid and 12 % of saturated fatty acids. Iodine number 85 gI/100g. (similar to A2 of the subject application)

Polar Nitrogen-Containing Compound:

B1) Product of the reaction of a terpolymer of $C_{14}/_{16}$-α-Olefin, maleic anhydride and

allylpolyglycol with 2 equivalents of ditallow fatty amine, 50 % active in aromatic naphtha. This is the same polar nitrogen-containing compound as disclosed as B1 in the subject application.

Other Typical Cold Flow Improvers:

B9) EVA copolymer (27 wt.-% vinyl acetate, molecular weight of 13.000), 50 % active in aromatic naphtha (comparison).

B10) Poly(tallow fatty ester of acrylic acid) (molecular weight of 75.000), 50 % active in aromatic naphtha (comparison).

B11) Behenic acid diester of poly(ethylene glycol) with molecular weight 600, 50 % active in aromatic naphtha (comparison).

In order to compare the differences between the low-temperature properties of compositions according to the subject application with fatty acid compositions containing fatty acids and other cold flow improvers (for example: B9, B10 and B11), the pour points (see Table 1), cloud points (see Table 2) and storage stabilities (seeTable 3) of these compositions were assessed. Pour points were measured in accordance with ISO 3016 and cloud points were measured in accordance with ISO 3015. The additives mixtures were then stored for 24 hours at -20 °C, and subsequently assessed visually (Table 3). (C) denotes comparative examples.

Table 1: Pour points of the additives

Example	Composition (parts by weight)					Pour Point [°C]
	A1	B1	B9	B10	B11	
1	80	20				-9
2	50	50				-27
3	20	80				-3
4 (C)	80		20			0
5 (C)	50		50			3
6 (C)	20		80			+12
7 (C)	80			20		-3
8 (C)	50			50		6
9 (C)	20			80		+15
10 (C)	80				20	0
11(C)	50				50	+12
12 (C)	20				80	+18
13 (C)	100					-6
14 (C)		100				+9
15 (C)			100			+18
16 (C)				100		+15
17 (C)					100	+21

Table 2: Cloud Points of the fatty acid solutions
For these examples the fatty acid was used as a formulation containing 50 % by weight of fatty acid in aromatic naphtha

Example	Composition (parts by weight)					Cloud Point [°C]
	A1	B1	B9	B10	B199	
18 (C)	100					-28.5
19	99,95	0,05				-34.0
20	99,8	0,2				-35.0
21	99,5	0,5				-33.5
22 (C)	99,8		0,2			-27.5
23 (C)	99,8			0,2		-29.0
24 (C)	99,8				0,2	-27.0

Table 3: Storage stability of the additives (storage for 24 hours at -20°C)

Example	Composition (parts by weight)					Assessment
	A2	B1	B9	B10	B11	
23 (C)	100					solid
24 (C)		100				solid
25 (C)			100			solid
26 (C)				100		solid
27 (C)					100	solid
28	80	20				liquid
29	50	50				liquid
30(C)	80		20			viscous gel
31 (C)	50		50			solid
32 (C)	80			20		viscous gel

33 (C)	50			50		solid
34 (C)	80				20	solid
35 (C)	50				50	solid

The resulting lower pour points of the fatty acids combinations with component B1, according to the subject application, over a broad range of concentrations clearly show that the additives disclosed in the subject application can be handled and used at much lower temperatures than neat fatty acids or fatty acids which were combined with other cold flow improvers. Similarly, after dilution of the fatty acids with solvent, the onset of crystallization as determined by the cloud point (See Table 2 hereinabove) can be shifted to lower temperatures by introducing the additive components of the subject application. Thus, additive concentrates comprising fatty acids, solvent and minor amounts of Applicant's polar nitrogen-containing compounds, according to the subject application, can be stored and handled at lower temperatures than neat fatty acid solutions or fatty acid solutions containing other flow improvers without the risk of sediment formation or filter blocking. Furthermore, the above results show that compared to combinations of the fatty acids and any other well-known cold flow improvers of the Japanese Reference, the fatty acids when combined Applicant's polar nitrogen-containing compounds, according to the subject application, do not gel or solidify during prolonged storage at low temperatures. Thus, the additive concentrates of the subject invention can be handled and used without prior heating or dilution, even after storage at low temperatures. These measurements show the superior properties of the claimed additive concentrates for stabilizing fatty acids at low temperature in comparison to other known middle distillate cold flow improvers cited in the Japanese Reference (JP 11-001692). No one skilled in the art could have predicted this surprising and unexpected performance in storage stability of the concentrated additive of the instant invention based on any combination of the JP reference or the '632 Patent. The rejection of claim 7 as amended under 35 U.S.C. §103(a) as being unpatentable

over JP 11001692 in view of US Patent 5,391,632 should be withdrawn for the reason that the JP 11001692 reference by requiring a middle distillate component teaches away from applicant's invention or is a best silent on any combination of the specific terpolymer/polar nitrogen-containing compound with a mixture of fatty acids in the form of a storage stable concentrate, and no one skilled in the art armed with the JP 11001692 reference or the '632 Patent, taken separately or together, would be motivated to arrive at applicant's invention by combining a mixture of fatty acids for lubricity improvement with a paraffin inhibitor as disclosed in the '632 Patent, based solely on the above disclosure in the '632 Patent which refers only to further paraffin inhibitors, not lubricity improvers. Furthermore, Applicant has shown unexpected results which demonstrate the storage stability and superior cold flow properties of the claimed combination which is superior to that of the individual components and to other flow improvers.

The rejection of Claims 11-13 and 15 as amended under 35 U.S.C. §103(a) as being unpatentable over JP 11001692 in view of US Patent 5,391,632 should be withdrawn for the reasons given in support of claim 7, and for the reason that claim 11 recites that the blending of Applicant's additive concentrate (as recited in claim 7) takes place at or below 0 °C. At such conditions anyone skilled in the art would expect the **mixtures of fatty acids** to be **solid or have sediment**, which can only be avoided by greatly diluting the fatty acid additives or by storing the fatty acid additives and blending the fatty acid additives at heated conditions to avoid the gelling and solidification of the fatty acids. No one skilled in the art would have expected that a concentrate comprising fatty acids and Applicant's polar nitrogen-containing terpolymer would have the properties or the benefits of applicant's additive concentrate. Applicant has demonstrated hereinabove that Applicant's additive is storage stable and liquid at temperatures at or below 0 °C. Nowhere in the JP reference or the '632 Patent or any combination thereof, discloses a method for directly adding a fatty acid based lubricity improver to a middle distillate at a temperature which is at or below 0 °C.

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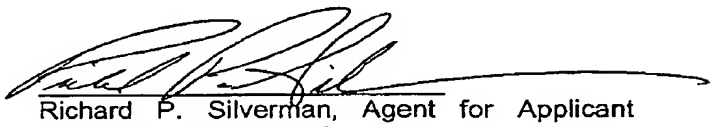
An early and favorable action on the merits is respectfully requested. The Commissioner is hereby authorized to charge any fee deficiency to Deposit Account No. 03-2060.

Respectfully submitted,



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